

Applicant(s): Cornelis L. G. Ham et al.
Serial No.: 10/791,024
Filed: March 2, 2004
For: METHOD OF AND DEVICE FOR THE COMPENSATION OF VARIATIONS OF THE MAIN MAGNETIC
FIELD DURING MAGNETIC RESONANCE IMAGING
Art Unit: 2859
Examiner: Fetzner, Tiffany A.

Attorney Docket No.: PHN17333B

REMARKS/ARGUMENTS

Reconsideration of the present application in view of the claims as set forth above, as amended, and further in view of the following remarks is respectfully requested. Claims 1-7, 9-15, 19 and 20 remain pending hereinafter, with claim 1 being the sole independent claim; claims 8 and 15-18 have been cancelled without prejudice or disclaimer of subject matter. No new matter has been added. Support for the proposed amendment(s) can be found in the specification, as originally filed, at page.

The Office Action dated April 7, 2005, rejected claims 1-20 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,566,875 to Hasson et al. (hereinafter the "Hasson reference"). Examiner Fetzner asserts at paragraph 9 of the office action that Hasson teaches a method of determining a compensation signal to compensate for a temporally varying field strength (col. 3, lines 27-47, col. 4, lines 23-51 and col. 9, lines 2-6) of the main field of a main magnet (col. 9, lines 46-65 for use with permanent magnet), and at least one gradient field coil.

Examiner Fetzner asserts the Hasson gradient field coil is a solenoid coil 20, adapted to generate an adjustable magnetic holding field component 300 (col. 9, lines 2-6; col. 16, lines 29-44) that is directional (**an applied gradient field**), and determining at least one quantity (Temp, pressure, current), which is characteristic of a temperature-dependent magnetic property of magnetizable material included as part of the MRI device, and interacts with the magnetic fields (col. Col. 4, lines 47-50, col. 13, lines 10-15, col. 18, etc.) of the device, the device and its immediate vicinity being substantially steady, and providing a compensation signal on the basis of the characteristic quantity (col. 3, lines 11-15, 27-35, col. 4, lines 30-51).

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In response, applicants respectfully submit that the present pending claims, i.e., independent claim 1, and claims 2-7, 9-14, 19 and 20, which depend from claim 1, all as amended hereby, are patentable over the Hasson reference at least because such reference fails to disclose and/or suggest all of the features associated with such claims.

That is, applicants' claim 1 sets forth a method of determining a compensation signal for the compensation of a temporally varying field strength of the main magnetic field of a main magnet of a magnetic resonance imaging system that includes at least one gradient field coil for generating a gradient magnetic field to adjust the main magnetic field with a compensation signal. The method includes determining at least one quantity which is characteristic (characteristic quantity) of a temperature-dependent magnetic property of a magnetizable material included as part of the magnetic resonance imaging system, and which interacts with the main magnetic field of such system, and generating the compensation signal, on the basis of said characteristic quantity, and providing the compensation signal to the gradient field coil for adjusting the temporally varying field strength.

Hasson discloses a portable monitoring system for determining a polarization level of a hyperpolarized gas using a magnetic holding field 300, automatically adjustable to a predetermined value by shifting a resonant frequency above that of "potentially substantially depolarizing environmental conditions." The Hasson invention determines the polarization of the gas in a way that accounts for NMR coil resonance to more accurately measure the polarization level of the gas, particularly in a presence of stray magnetic fields. The method includes periodically transmitting a predetermined excitation pulse to the gas, and analyzing the corresponding NMR signal response back from the gas, by which the level of polarization is determined. More particularly, the response

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NMR signal from the hyperpolarized gas is analyzed and a frequency dependent correction factor is generated, the compensation correction factor is applied to adjust the signal polarization value to compensate for any external-induced frequency shift which may appear in the measured signal value.

The Hasson adjustment signal is transmitted directly to the solenoid coil (main field coil), where the current input is adjusted based on fluctuation in the field strength indicated by the NMR signal response, which response is driven by the current input and correlated with the adjustment factor. While Hasson does supply an adjustment signal to the main field coil (solenoid), applicants' invention generates and sends the adjustment signal to the gradient field coil, which coil thereby adjusts the main field to a desirable state. That is, Hasson does not teach or suggest the element of applicants' claims which determines at least one quantity which is characteristic (characteristic quantity) of a temperature-dependent magnetic property of a magnetizable material included as part of a magnetic resonance imaging system, and which interacts with the main magnetic field of such system, and generating the compensation signal, on the basis of said characteristic quantity, and providing the compensation signal to the gradient field coil for adjusting the temporally varying field strength of the main field.

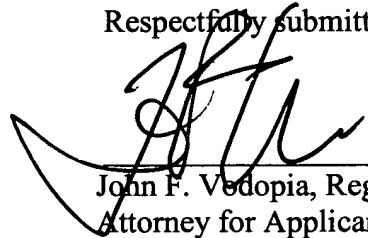
In sum, Applicants respectfully submit that independent claim 1 is patentably distinct from Hasson for at least the reason set forth, and request that the Examiner remove the rejection to claim 1 under Section 102 in view of Hasson. For that matter, because each of remaining pending claims 2-7, 9-14, 19 and 20 depend from claim 1, dependent claims 2-7, 9-14, 19 and 20 are patentable under 102 in view of Hasson for at least the reasons set forth above for the patentability of independent claim 1, and respectfully request withdrawal of the rejection of claim 2-7, 9-14, 19 and 20.

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Applicants conclude, therefore, that the present application is in condition for allowance and more particularly that current pending 1-7, 9-14, 19 and 20 are clearly patentable over the art of record, including Hasson. Accordingly, entry of this amendment, reconsideration of the rejections of the claims over the references cited, and allowance of this application is earnestly solicited.

Respectfully submitted,



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